

Implementing and Managing Demand Response With Technology

Michael R. Tennefoss
Echelon Corporation

Copyright © 2002, Echelon Corporation. All rights reserved.

ECHELON®

Economic, market, technological discontinuities drive change, create opportunities

- Economic issues
  - High construction costs and shareholder concerns force better utilization of existing generating and distribution systems, equitable real-time pricing based on usage and cost
- Market changes
  - Competition puts downward pressure on prices/margins, threatens market share and customer loyalty, drives consolidation
  - Opens possibilities for high margin, fast growth unregulated businesses
- Technological innovation
  - Drives the integration of networks – telephony, internet, control, data, video – and increasing the availability of Internet connections

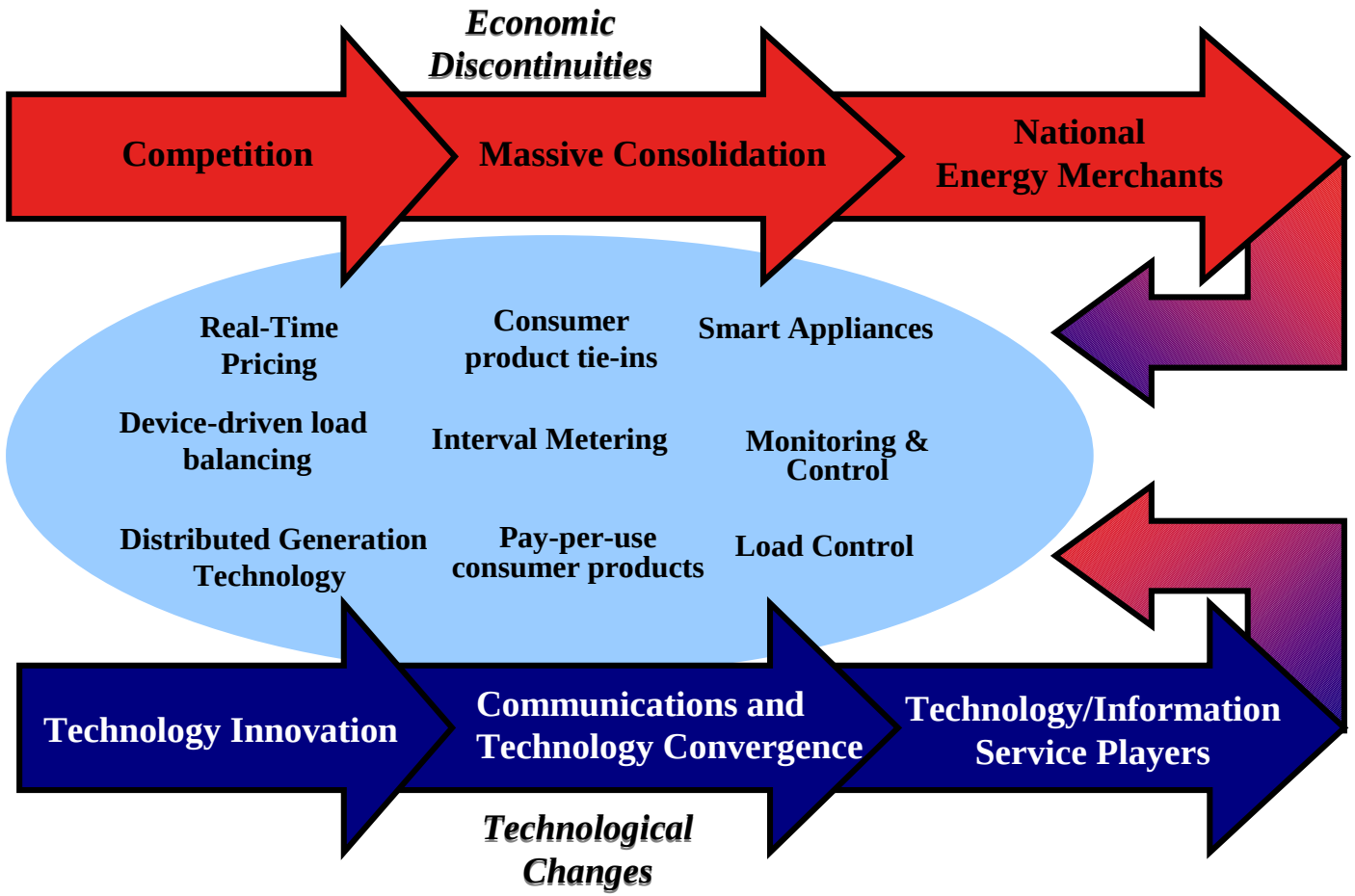
ECHELON®

The confluence of these forces puts pressure on all parties, seemingly conflicting goals

- Utilities need ways to cut costs, charge realistically for consumed energy, identify new revenue sources, satisfy consumers and shareholders, and, ultimately, remain viable
- Consumers need to reduce peak loads, pay for what they use, and have dependable, economical, ecologically-sound sources of energy
- Government institutions need the trust (and votes) of constituents, an economic climate conducive to growth, adherence to a myriad of laws
- Technology companies need to bring solutions to market in a timely manner - time to market determines market leadership and perhaps survival as well

ECHELON®

Change creates significant business opportunities for the savvy



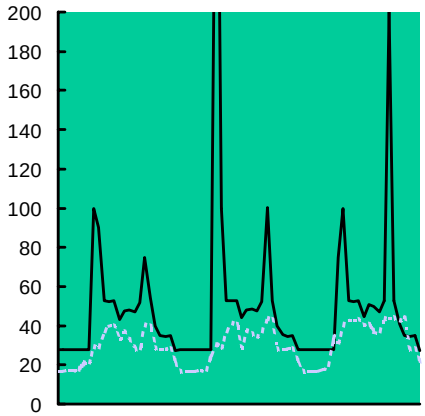
ECHELON

Europe is leading the way in demand response...using California technology!

- The infrastructure required for demand response provides the foundation for value-added services
  - The same infrastructure used for real-time tiered pricing, meter reading, theft reduction, connect/disconnect, load control...
  - ... supports high value services such as pay-per-use appliance monitoring, remote control, alarms, lighting
- Provides long-term business opportunities, reduced operating costs, 3rd party access, privacy, separation of regulated and unregulated services, fair allocation of costs for services

ECHELON®

The infrastructure can be commissioned in stages: minimizes costs, leverages earlier stages



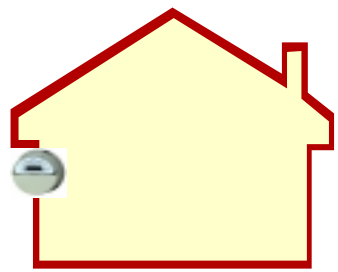
- Phase 1 – Demand Control
  - Increase operating efficiencies - service center integration, theft detection, real-time pricing, automated meter reading, remote failure detection to cut expensive truck rolls
  - Shift demand to preserve gross margins on the last kwh
  - Implement at a total installed cost of around $100 per meter
  - Achieve fast payback for this infrastructure by the time the last meter is installed

ECHELON

Staged Services Roll-out

Phase 1
Service center integration, fault monitoring, load balancing

Phase 1
Real-time/time-of-use pricing, tariffs, theft detection



Phase 1
Demand side management/ automated meter reading

ECHELON

The infrastructure can be commissioned in stages: minimizes costs, leverages earlier stages

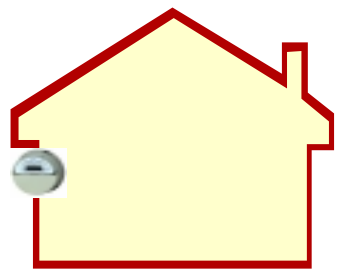
- Phase 2 – Added-Value Services Launched On Top of Phase 1 Infrastructure
  - Consumer benefits - remote fault and alarm monitoring and control, pay-per-use appliances, repair services, messaging
  - Utility benefits – expands distribution business over existing power mains, new service offerings, decrease customer churn
  - 3rd party service provider benefits – new business opportunities
  - Government benefits - leverages existing utility plant, controlled demand minimizes pollution and need for new plants, encourages new businesses, service tax revenues, solidifies business confidence

ECHELON®

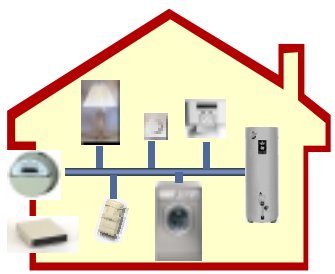
Staged Services Roll-out

Phase 1
Service center integration, fault monitoring, load balancing

Phase 1
Real-time/time-of-use pricing, tariffs, theft detection



Phase 1
Demand side management/ automated meter reading



Phase 2
Added-value services

ECHELON®

The infrastructure can be commissioned in stages: minimizes costs, leverages earlier stages

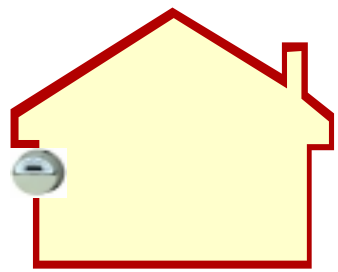
- Phase 3 – Integrated Services Launched On Top of Phase 1 and Phase 2 Infrastructure
  - Consumer benefits – merges data, entertainment, control infrastructures without the need to scrap anything
  - Utility benefits –new service offerings and opportunities for joint ventures
  - Service provider benefits – new 21st century business opportunities
  - Government benefits - encourages new information-related businesses, service tax revenues. Singapore, Korea, China, Finland, Sweden and others are building infrastructure to get here!

ECHELON

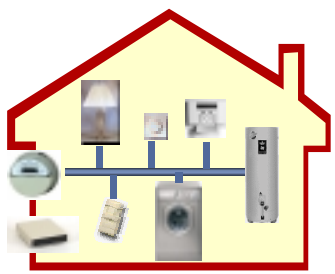
Staged Services Roll-out

Phase 1
Service center integration, fault monitoring, load balancing

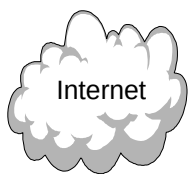
Phase 1
Real-time/time-of-use pricing, tariffs, theft detection



Phase 1
Demand side management/ automated meter reading



Phase 2
Added-value services



OSGi

Phase 3
Broadband home gateway: control, infotainment, data

ECHELON

Who pays, who reaps the rewards?

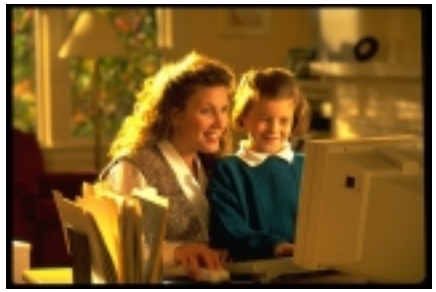
- The infrastructure pays for itself
- All parties reap rewards

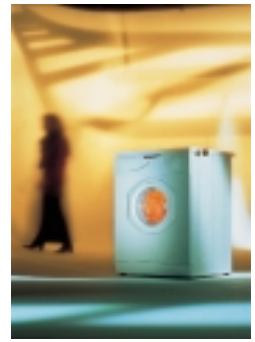
How is this possible? Are there example deployments?

Copyright ©Brian Biggs

ECHELON®

Who is Echelon?



- Echelon is a networking company that makes an open, standards-based infrastructure called LONWORKS®
  - LONWORKS enables everyday devices to be made “smart” and to communicate with one another and the Internet
- Echelon is the leader in networking everyday devices
  - 18,000,000+ devices shipped
  - Thousands of OEMs
  - Authorized network integrators worldwide

ECHELON®

Echelon makes tools for building end-to-end solutions...

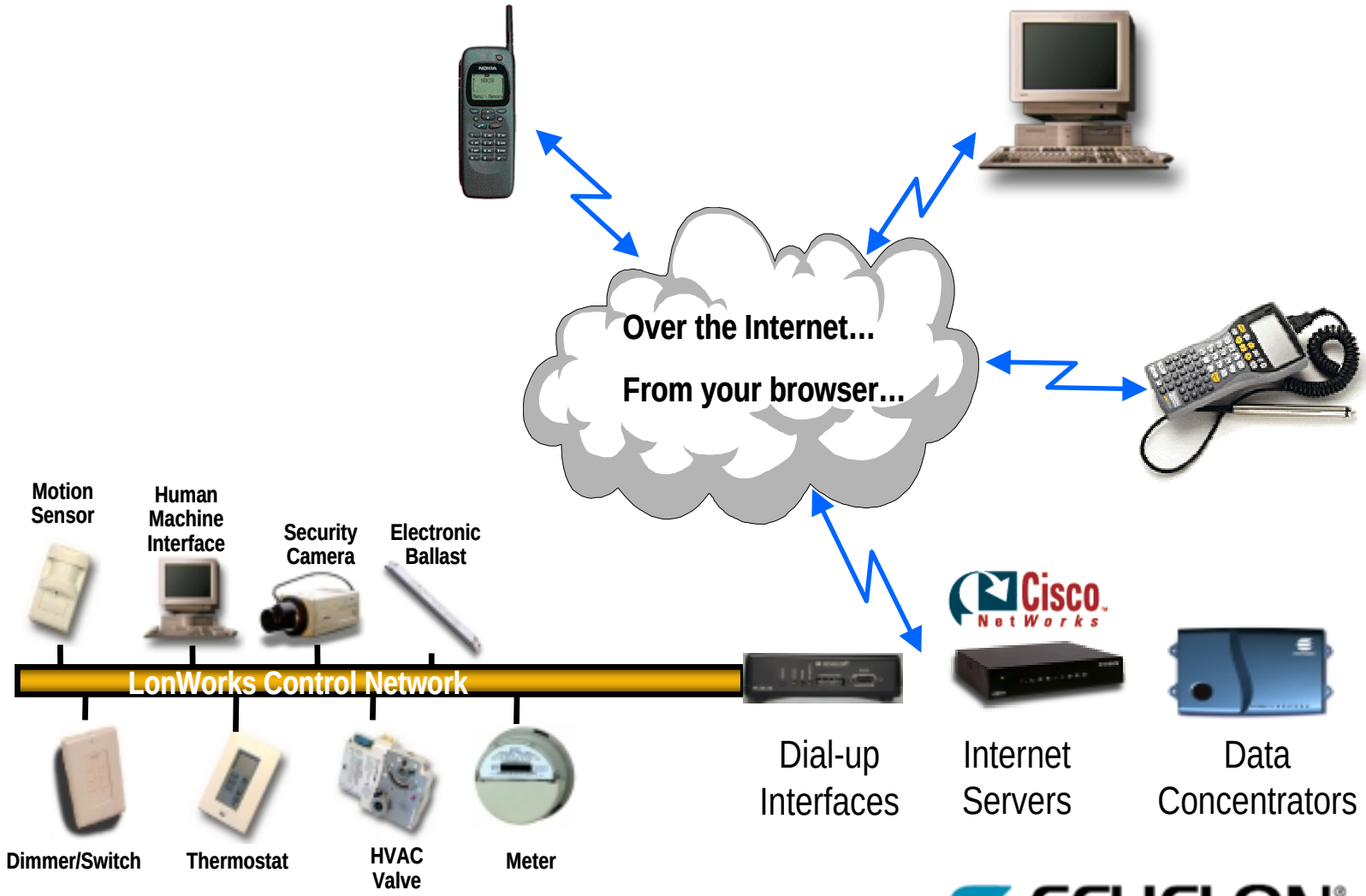
Network Management Software

Development Tools

Power Line & Twisted Pair Transceivers, Controllers, NICs

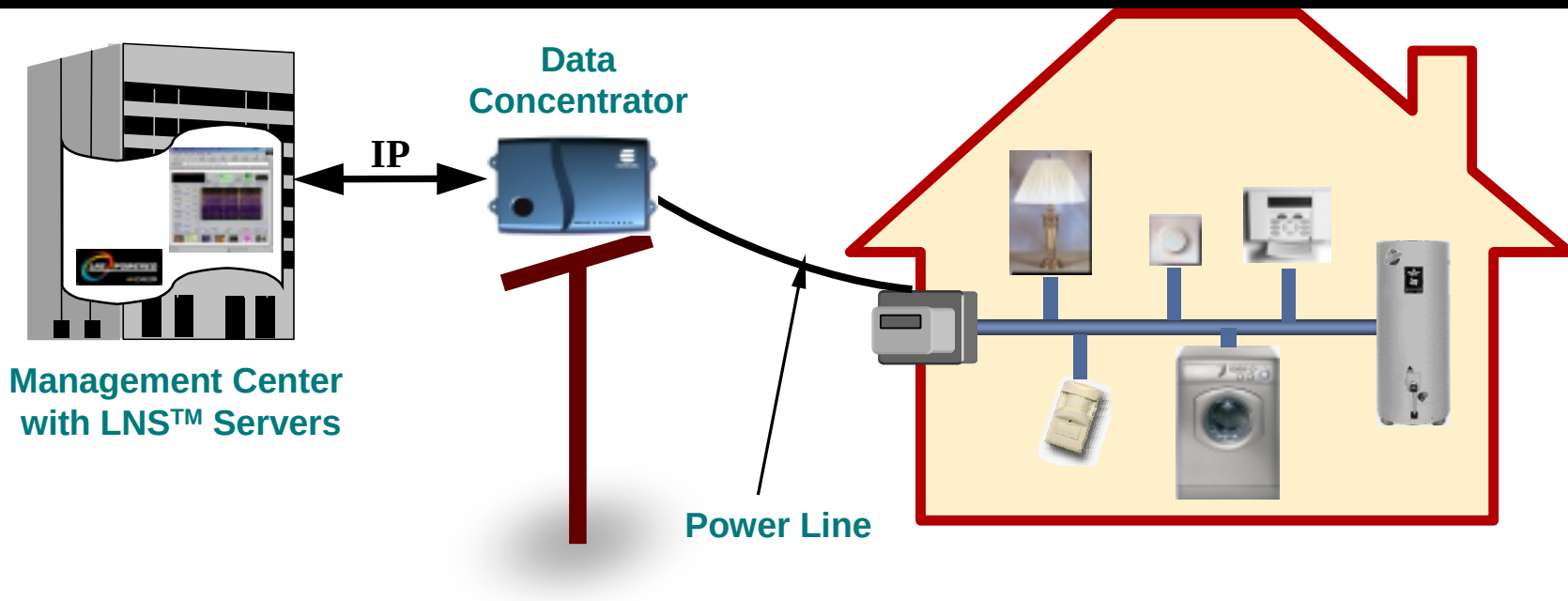
Routers, Internet Servers

... accessible from anywhere in the world by phone, RF, or over the Internet



An Example Deployment

World's Largest Publicly Traded Utility



- World's largest demand response deployment: *27 million* homes and buildings with smart meters
  - More networked customers than AOL
- Transforming the power grid into an intelligent services delivery platform
  - Energy-related services
  - Value-added services

Key energy-related services enabled by Echelon – Phase 1

- Automated meter reading
- Demand-side management
  - Load balancing
  - Load curtailment
  - Demand forecasting
- Enhanced pricing
  - Real-time pricing
  - Time-of-use pricing
- Outage detection and isolation
- Remote customer connect & disconnect
- Theft and tamper detection

Key value-added services enabled by Echelon – Phase 2

- Appliances and white goods
  - Remote monitoring
  - Remote control
  - Remote diagnostics
  - Pay-per-use
- Security Monitoring
- Medical Emergency Signaling
- Advertising and response
- Vending Machines
  - Statistics
  - Faults
  - Out of stock

System highlights

- $2.2 billion project cost
- $25/year/customer savings
- *Meters cost around $100 installed*
  - Multi-tariff, remote disconnect digital meters cost less than analog meters
  - Lower cost per connected home or building than *any* other system
- *Payback less than 4 years*
  - Cost reduction and efficiency gains from regulated services
- Platform supports value-added services - pure “upside” revenue

Who benefits from this architecture?

- Utilities (electricity, gas, water)
  - Cut costs, real-time pricing
  - New revenue sources –added-value services like pay-per-use and messaging, co-branding, targeted marketing
  - Satisfied consumers and shareholders
- Consumers
  - Increased availability of energy, fairly priced
  - Always on network for messaging
  - New services, convenience, comfort, safety
- Government institutions
  - Reliable infrastructure, happy constituents, documented adherence with regulations
- Technology companies
  - New business and product opportunities

ECHELON®

California is a perfect market for Enel-like systems

- Market discontinuities have created opportunities
- Echelon's low-cost, demand response systems leverages existing assets, improves customer loyalty, generates new revenue streams and businesses
  - *Deployable today*
  - *Low installed cost, low life-cycle costs*
  - Scalable and expandable without changing device
  - Robust, field proven
- The infrastructure pays for itself and all parties benefit

ECHELON®

Thank you for listening!

ECHELON®